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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/029,101	12/20/2001	Richard L. Woodin	XDEV1140	8517
7590 09/29/2004				
THOMAS R. FITZGERALD, ESQ 16 E. MAIN STREET SUITE 210 ROCHESTER, NY 14614-1803				
			EXAMINER DIAZ, JOSE R	
			ART UNIT 2815	PAPER NUMBER

DATE MAILED: 09/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/029,101	Applicant(s) WOODIN ET AL.	
	Examiner José R. Díaz	Art Unit 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 June 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7-17 and 19-28 is/are rejected.
- 7) ☒ Claim(s) 18 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>3/11/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 28, 2004 has been entered.

Claim Objections

2. Claims 11, 13 and 23 are objected to because of the following informalities:
- a. Regarding claim 11, the phrase "the material is aluminum" in lines 1-2 should be changed to --the [[material]] metal is aluminum--.
 - b. Regarding claims 13 and 23, the temperature "660 degrees" should be expressed as --660 degrees Celsius--

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 7-10, 12-14, 16-17, 19-20, 22-24, and 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Edmond et al. (US Pat. No. 5,416,342) in view of Levinstein et al. (US Pat. No. 3,965,279).

Regarding claims 7, 19 and 28, Edmond et al. teaches a well-known process for forming an electrical connection to a semiconductor device comprising:

- c. forming a first metal-containing layer (14), wherein the first metal containing layer:
 - i. consists substantially of a metal (aluminum) having a melting point of less than approximately seven hundred (700) Celsius (See col. 5, lines 1-17. Please note that aluminum has a melting point of less than 700 °C) ;
 - ii. , contacts an exposed region that includes silicon carbide (See col. 5, lines 8-10); and
 - iii. has a composition that does not form an ohmic contact with a doped silicon carbide if annealed for a time period of less than ten hours

and at a temperature less than a melting point of the metal within the metal-containing layer (See col. 5, lines 11-13); and

- d. annealing the metal-containing layer and the exposed region, wherein a substantially continuous ohmic contact region is formed between the first metal-containing layer and the silicon carbide (See col. 5, lines 3-6).

However, Edmond et al. teaches fails to teach annealing at a temperature less than the melting point of the metal within the metal-containing layer and for a period of time in excess of ten hours. Levinstein et al. teaches that it is well known in the art to form an ohmic contact by heating the metal layer at a temperature less than a melting point of the metal (See col. 1, lines 36-39) and for a period of time in excess of ten hours (See col. 3, lines 17-21).

Edmond et al. and Levinstein et al. are analogous art because they are from the same field of endeavor as applicant's invention. At the time of the invention it would have been obvious to a person of ordinary skill in the art to anneal the metal-containing layer and the exposed region at a temperature less than the melting point of the metal within the metal-containing layer and for a period of time in excess of ten hours. The motivation for doing so, as is taught by Levinstein et al., is forming ohmic contacts with well-defined dimensions (col. 1, lines 27-30 and col. 2, lines 37-44). Therefore, it would have been obvious to combine Levinstein et al. with Edmond et al. to obtain the invention of claims 7-10, 12-14, 16-17, 19-20, 22-24, and 26-28.

Regarding claim 8, Edmond et al. teaches that the metal is aluminum (col. 5, lines 8-9).

Regarding claim 9, Levinstein et al. teaches annealing for a time period of at least twenty hours at a temperature in a range of approximately 400-660 °C (see col. 1, lines 36-39 and col. 3, lines 17-21).

Regarding claims 10 and 20, Edmond et al. teaches the composition is substantially pure aluminum ("not alloyed") (see col. 5, lines 9-10).

Regarding claims 12 and 22, Levinstein et al. teaches annealing for a time period of at least approximately 25 hours [please note that Levinstein et al. teaches a time period of 24 hours (col. 3, lines 20-21), which is "approximately" 25 hours].

Regarding claims 13 and 23, Levinstein et al. teaches a temperature of no greater than approximately 660 °C (see col. 1, lines 36-39 and col. 3, lines 23-24).

Regarding claims 14 and 24, Levinstein et al. teaches that annealing forms an alloy (see col. 3, lines 25-28).

Regarding claims 16-17 and 26-27, Levinstein et al. teaches performing the annealing in a vacuum or using a noble gas (col. 3, lines 43-47).

6. Claims 11, 15, 21 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Edmond et al. (US Pat. No. 5,416,342) in view of Levinstein et al. (US Pat. No. 3,965,279), and further in view of Sano (JP 59-214224 A).

Regarding claims 11, 15, 21 and 25, a further difference between the prior art and the claimed invention are: a metal containing layer comprises of at least approximately 90 weight percent aluminum, a p-type doped exposed region, and forming an aluminum silicon carbide alloy. Sano teaches that it is well known in the art

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to form a metal containing layer comprising at least approximately 90 weight percent aluminum on a p-type SiC (See Constitution. Please note that Sano the ratio of composing Al atoms is as high as 93%).

Sano, Edmond et al. and Levinstein et al. are analogous art because they are from the same field of endeavor as applicant's invention. At the time of the invention it would have been obvious to a person of ordinary skill in the art to further form a metal containing layer comprising at least approximately 90 weight percent aluminum on a p-type SiC. The motivation for further doing so, as is taught by Sano, is to obtain an electrode with excellent ohmic characteristics (Abstract: "PURPOSE"). Therefore, it would have been obvious to further combine Sano with Edmond et al. and Levinstein et al. to obtain the invention of claims 11, 15, 21 and 25.

Allowable Subject Matter

7. Claim 18 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. The following is a statement of reasons for the indication of allowable subject matter: the prior art fails to teach, disclose, or suggest, either alone or in combination, a method of forming an ohmic contact comprising the steps of: forming an metal containing layer consisting substantially of a metal having a melting point of less than approximately 700 °C on a SiC; annealing at a temperature less than the melting point of the metal within the metal-containing layer and for a period of time in excess of ten

hours; removing a portion of the first metal containing layer; and forming second metal containing layer over the contact region.

Response to Arguments

9. Applicant's arguments with respect to claims 7-17 and 19-28 have been considered but are moot in view of the new grounds of rejection.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following references teach the formation of an ohmic contact at low temperature: Slater, Jr. et al. (US 2004/0171204 A1), paragraph [0048]; Gerner et al. (US Pat. No. 5,250,466), col. 3, lines 24-34); Lee et al. (US Pat. No. 4,602,421), col. 4, lines 3-9; and Lin (US Pat. No. 4,301,592), col. 3, lines 64-68.

Correspondence

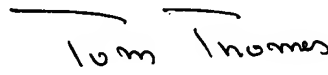
Any inquiry concerning this communication or earlier communications from the examiner should be directed to José R. Díaz whose telephone number is (571) 272-1727. The examiner can normally be reached on Monday through Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JRD
9/27/04


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